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TEST CODE FOR GROUNDNUT DIGGER, ANIMAL DRAWN

UDC 631·356·274 [633·368] : 620·1

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Indian Standard

TEST CODE FOR GROUNDNUT DIGGER, ANIMAL DRAWN

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AMENDMENT NO. 1 MAY 2002
TO
IS 11235 : 1985 TEST CODE FOR GROUNDNUT DIGGER, ANIMAL DRAWN

(*Page* 7, *clause* 8.1.3, *line* 9) — Substitute 'burried pods (unexposed + undug pods)' *for* 'burried pods'

(*Page* 7, *clause* 8.1.3, *line* 10) — Substitute 'dug plants' *for* ' plants'.

(FAD 59)

Reprography Unit, BIS, New Delhi, India

Indian Standard

TEST CODE FOR GROUNDNUT DIGGER, ANIMAL DRAWN

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 March 1985, after the draft finalized by the Harvesting and Threshing Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Groundnut diggers are being increasingly manufactured and used in the country. It was felt that standard procedure should be laid down for testing the animal-drawn groundnut digger in order to have a uniform pattern of testing the animal-drawn groundnut digger. This would also help the manufacturers to develop and the purchasing agencies to select suitable digger to meet their requirements.

0.3 In preparation of this standard, assistance has been derived from M/s Jyoti Ltd, Vadodara.

0.4 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the method of testing animal drawn groundnut diggers to evaluate their performance.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Total Losses — The sum of the following losses in the field during the test:

a) *Exposed Pod Loss* — The detached pods lying on the surface with respect to total pods, expressed as percentage by mass;

---

*Rules for rounding off numerical values (*revised*).

b) *Un-exposed Pod Loss* — The detached pods remain burried in the soil with respect to total pods, expressed as percentage by mass; and

c) *Undug Pod Loss* — Pods lost due to the plants remaining undug or detached pods remain burried in the soil with respect to total pods, expressed as percentage by mass.

2.2 Damaged Pods — The hull damaged and shelled pods including hulls and kernels with respect to total pods, expressed as percentage by mass.

2.3 Digging Efficiency — Percentage by mass of the undetached pods obtained from the plants dug with respect to total pods.

3. SELECTION OF DIGGER FOR TEST

3.1 Selection — The digger shall be selected, either at random from the series production or a prototype, by the testing station with the agreement of the manufacturer.

3.2 Specification and Other Literature — The groundnut digger manufacturer shall supply a specification sheet of the digger duly filled in as given in Appendix A. The manufacturer shall also supply the literature about operation and maintenance of the digger as well as a schematic diagram.

4. PRE-TEST OBSERVATIONS

4.1 Moisture Content of the Soil — The soil samples shall be taken from at least five random places in the field and tested for moisture content in accordance with any one of the methods preferably oven-drying method as stipulated in IS : 2720 (Part 2)-1973*.

4.2 Moisture Content of Pods and Vines — Take the samples of pods and vines from at least five random places. The samples shall be tested for moisture content in accordance with **6.1** of IS : 7897-1975†.

4.3 Determination of Pod and Vine Ratio — Take five samples of the crop each weighing one kilogram. Separate the pods from vines manually for each sample. Take the mass of pod and vines separately for each sample, and calculate their ratio. The average of the five samples shall be taken as pod-vine ratio.

4.4 The other details regarding soil and crop given in Appendix B shall be noted.

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*Method of tests for soils: Part 2 Determination of water content (*second revision*).

†Test code for chaff cutters.

5. TESTS

5.0 The tests recommended in **5.1** and **5.2** shall be carried out in the laboratory and in the field respectively.

5.1 Laboratory Tests — The following tests shall be conducted in the laboratory:

a) Checking of specifications and material, and

b) Visual observations and provision for adjustments (*see* **6.2**).

5.2 Field Tests

5.2.1 *Short-Run Tests* (*see* **8.1**)

a) Width and depth of cut (*see* **8.1.1**),

b) Percentage of damaged pods [*see* **8.1.3**(b)],

c) Percentage of exposed pod loss [*see* **8.1.3**(c)],

d) Percentage of unexposed pod loss [*see* **8.1.3**(d)],

e) Percentage of undug pod loss [*see* **8.1.3**(e)],

f) Digging efficiency (*see* **8.1.4**),

g) Power requirement (*see* **8.1.5**),

h) Field efficiency and labour requirement (*see* **8.1.6**),

j) Ease of operation and adjustments (*see* **8.1.7**), and

k) Soundness of construction (*see* **8.1.8**).

5.2.2 *Long-Run Tests* (*see* **8.2**)

6. LABORATORY TESTS

6.1 Checking of Specification — The specification supplied by the manufacturer as given in Appendix A shall be checked and reported.

6.2 Visual Observations — The observations given in Appendix C shall be assessed visually and reported.

7. SELECTION OF LAND AND PREPARATION OF SAMPLE FOR FIELD TESTS

7.1 Selection of Land

7.1.1 The minimum area of the plot for testing animal-drawn groundnut digger shall be 0·25 hectare. The ratio of width and length should be as far as posible 1 : 2.

7.1.2 The following field conditions of the plot shall be checked and reported.

a) Site of the plot,

b) Type of soil,

c) Topography of the field,

d) Soil moisture percentage,

e) Bulk density of the soil, and

f) Cone index of the soil.

7.2 Preparation of the Sample

7.2.1 The testing authority shall ensure that the digger has been properly assembled after laboratory test.

7.2.2 All the attachments and accessories required for field use shall be fitted in place and the adjustments made shall be in accordance with the manufacturer's recommendations (*see* **3.2**).

7.2.3 The digger should be properly hitched with the yoke.

8. FIELD TESTS

8.1 Short-Run Tests — Operate the groundnut digger on the crop row. During the operation, collect the samples randomly from 10 places for the area having width equal to crop spacing and length as 2·0 m. At least three series of field tests shall be carried out under different soil conditions. Depending upon the facilities available, additional series of field tests may be conducted.

8.1.1 *Width and Depth of Cut* — Measure the width and depth of cut for minimum five places and obtain the average of the readings.

8.1.2 *Analysis of Samples* — The different samples collected from the ten randomly selected areas (*see* **8.1**) should be analyzed for following:

a) *Damaged pods* — The plants dug should be collected and all the mature pods should be detached manually and analyzed for the damaged pods.

b) *Exposed pods* — After collecting the plants, visualize the crop row and collect the detached pods from 2 m length lying exposed on the soil surface.

c) *Unexposed pods* — The area of the soil having length as 2 m (*see* **8.1**) should be analyzed for the detached pods lying burried in the soil. For the collection of pods the soil should be dug out manually.

d) *Undug pods* — Collect the undug plants, if any, and detach the mature pods from the plants and weigh it.

8.1.2.1 Record the data in data sheet as given in Appendix D.

8.1.3 *Calculations* — From the data obtained above, calculate the following:

a) $A = B + C$

where

A = total quantity of pods collected from the plants in the sample area;

B = quantity of clean pods collected from the plants dug in the sample area, exposed pods lying on the surface and the burried pods; and

C = quantity of damaged pods collected from the plants in the sample area.

b) Percentage of damaged pods $= \frac{C}{A} \times 100$

where

C = quantity of damaged pods collected from the plants in the sample area, and

A = total quantity of pods collected from the plants in the sample area.

c) Percentage of exposed pod loss $= \frac{G}{A} \times 100$

where

G = quantity of detached pods lying exposed on the surface, and

A = total quantity of pods collected from the plants in the sample area.

d) Percentage of unexposed pod loss $= \frac{H}{A} \times 100$

where

H = quantity of detached pods remained inside the soil in the sample area, and

A = total quantity of pods collected from the plants in the sample area.

e) Percentage of undug pod loss $= \frac{K}{A} \times 100$

where

K = quantity of pods remained undetached from the undug plants in the sample area, and

A = total quantity of pods collected from the plants in the sample area.

8.1.4 *Determination of Digging Efficiency*

Digging Efficiency = 100 − Total percentage of pod loss

where

Total percentage of pod loss = percentage of exposed pod loss
+ percentage of unexposed pod loss
+ percentage of undug pod loss

8.1.5 *Power Requirement*

a) Insert a dynamometer in the hitch to measure the draft (in N or kgf). The draft is defined as the horizontal component of pull parallel to the line of motion. If the line of pull through the dynamometer is not horizontal, measure the angle which the line of pull makes with the horizontal and calculate the horizontal component (draft) by the following formula:

$$D = P \cos \theta$$

where

D = draft in N or kgf,

P = pull in N or kgf, and

θ = angle between line of pull and horizontal.

b) Lay off a space of 30 m in the middle of a long row and mark each end of this space with an easily distinguished pole.

c) Operate the digger in the field for digging the groundnut crop. Start the digger well in advance of the first pole marker and ensure that it is operating uniformly when it reaches this pole. As the digger operate in 30 m space, record the dynamometer reading at about 4 to 5 minutes intervals. Average these readings for obtaining the average draft for 30 m run. A stop-watch or other accurate time piece should be used to record the time for the digger to traverse the 30 m. From this value the speed of travel in metre per second can be calculated. Also calculate the theoretical field capacity, knowing the width of cut and speed of travel.

d) Calculate the power from the following formula:

$$\text{Metric hp} = \frac{\text{Draft in kgf} \times \text{Speed in metre per second}}{75}$$

e) Repeat the above a minimum of 5 times to arrive at average power requirement. Data should be recorded as in Appendix E.

8.1.6 *Field Efficiency and the Labour Requirement* — The theoretical field capacity in hectare per hour may be taken from the power requirement tests. It is the rate of field coverage that would be obtained if the digger was operating continuously without interruptions (twining at the ends, unclogging the blade, etc). The effective field capacity is the actual average rate of coverage. It includes the time lost in turning at the end of the rows, making adjustments, unclogging the blades, etc. The labour requirement for operating the digger is measured at the same time that the field capacity is measured. It can be expressed in two ways, firstly, the number of labourers required to operate the digger and secondly, the number of man hours used to cover one hectare of effective field area. Record the data according to Appendix F.

8.1.7 *Ease of Operation and Adjustments* — Assess and record the observations regarding ease of operation and adjustments during the test.

8.1.8 *Soundness of Construction* — Check the deformation and breakage of parts during the test.

8.2 Long-Run Tests — The digger shall be operated for at least 25 hours exclusive of the period covered under short-run tests (*see* **8.1**). If possible, it may be run for 100 hours. The major breakdown, defects developed and repairs made during this period shall be reported.

9. REPORTING RESULTS

9.1 For reducing the data to a usable form prepare a summary report in accordance with Appendix G.

APPENDIX A

(*Clauses* 3.2 *and* 6.1)

SPECIFICATION SHEET

To be Filled by

Manufacturer Testing Station

1. General
    - a) Name of manufacturer
    - b) Type
    - c) Make
    - d) Serial No.
    - e) Model
    - f) Year of manufacture
2. Working Tool Bar
    - a) Type of tool
    - b) Angle with respect to the vertical
    - c) Nominal width
    - d) Lifting or lowering of the tool
    - e) Ground clearance under the tool while transporting
    - f) Depth control
3. Ground Wheels
    - a) No. of wheels
    - b) Type of wheels
    - c) Size
4. Type of Hitch and its Details
5. Details of Range of Adjustments
6. Name of the Lubrication Points
7. Overall Dimensions
    - a) Length
    - b) Width
    - c) Height
    - d) Weight

8. Details of Material of Construction

Sl No.	*Name of Part*	*Material*	*Size in mm*
i)			
ii)			
iii)			

Testing Engineer

APPENDIX B

(*Clause* 4.4)

PRE-TEST OBSERVATIONS

Observations:

Date
Place

a) Name and type of variety of groundnut
b) Row-to-row spacing
c) Plant-to-plant spacing
d) Type of soil
e) Moisture content of soil
f) Moisture content of pods
g) Moisture content of vines
h) Pod-to-vine ratio
j) Depth of the pods in the soil
k) Total bio mass per sq m.

Testing Engineer

APPENDIX C

(*Clause* 6.2)

DATA SHEET FOR VISUAL OBSERVATIONS

Observations:

a) Provision for transportation
b) Provision for easy changing of components requiring frequent replacement
c) Provision for conveying the dug out vines
d) Provision for the depth control of blade
e) Provision for changing the blade angle
f) Provision for changing the angle of hitch
g) Other observations

Testing Engineer

APPENDIX D

(*Clause* 8.1.2.1)

LOSSES AND EFFICIENCY OF THE MACHINE

PLOT NO.	AMOUNT OF DETACHED PODS LYING ON SURFACE, kg	AMOUNT OF DETACHED PODS BURRIED IN THE SOIL SURFACE, kg	TOTAL AMOUNT OF DETACHED PODS, kg	AMOUNT OF PODS ATTACHED WITH THE UNDUG PLANTS, kg	TOTAL POD LOSS, kg	AMOUNT OF POD ATTACHED WITH DUG PLANTS, kg	TOTAL AMOUNT OF PODS, kg	TOTAL AMOUNT OF DAMAGED PODS, kg
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

PERCENTAGE OF EXPOSED POD LOSS	PERCENTAGE OF UNEXPOSED POD LOSS	PERCENTAGE OF DETACHED LOSS	PERCENTAGE OF UNDUG LOSS	PERCENTAGE OF TOTAL LOSS	PERCENTAGE OF DAMAGE	DIGGING EFFICIENCY
(10)	(11)	(12)	(13)	(14)	(15)	(16)

Testing Engineer

APPENDIX E

[*Clause* 8.1.5 (e)]

POWER REQUIREMENT FOR THE DIGGER DATA SHEET

TEST No.	TOTAL MARKED SPACE m	RUN No.	LENGTH OF RUN, m	TIME SPENT TO COVER THE RUN, sec	SPEED IN m/sec	AVERAGE DRAFT kgf	METRIC HORSE POWER	THEORETICAL FIELD CAPACITY, ha/h
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

APPENDIX F

(*Clause* 8.1.6)

FIELD EFFICIENCY AND LABOUR REQUIREMENT DATA SHEET

FIELD No.	SIZE		TIME SPENT			AREA COVERED			EFFECTIVE FIELD CAPACITY ha/h	NO. OF LABOURERS USED	LABOUR REQUIREMENT MAN HOUR PER ha	REMARKS
	Width	Length	Starting Time	Ending Time	Total Time Spent	Width m	Length	Area ha				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

APPENDIX G

(*Clause* 9.1)

SUMMARY REPORT

1. Name of manufacturer
2. Model
3. Time covered during field tests
4. Nature of test
5. Performance
6. Breakdowns
7. Wear on components
8. Base of replacement of parts
9. Suggestions for improvement (if any)
10. General remarks

Testing Engineer

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